

Comparison and Compositionality

Scott Fults

University of Maryland, College Park

1. Introduction

This paper is concerned with the syntax and semantics of *comparison phrases* such as those in boldface below.

(1) *Comparison Phrases*

- a. **Compared to John**, Bill is tall.
- b. **In comparison to John**, Bill is tall.
- c. **With regards to John**, Bill is tall.
- d. **With respect to John**, Bill is tall.

Comparison phrases seem to denote the comparison class over which a scalar adjective is interpreted. In the above examples, Bill is not simply tall, but rather he is tall only when he is compared to John. In fact, Bill might be short compared to every other person in the world.

Beck, Oda and Sugisaki (2004) claim that English comparison phrases are sentence level adjuncts that are not semantically compositionl. Instead, they are pragmatic "context setters". As evidence of this, Beck, et al. point out that comparison phrases can adjoin to many positions in a sentence.

- (2) a. Compared to John, Bill is tall.
- b. Bill, compared to John, is tall.
- c. Bill is, compared to John, tall.
- d. Bill is tall, compared to John.

Their claim about compositionality is based on the following reasoning. Here is a typical degree analysis of scalar adjectives (Heim and Kratzer 1998).

- (3) a. Bill is tall.
- b. $\exists d$ [Bill is d -tall & $d > c$] where c = the height standard made salient by the utterance context

If comparison phrases are supposed to supply the value of the c variable, then we need someway to compositionally derive a degree term from *compared to John*. But there is nothing inside of *compared to John* to abstract degrees over since it doesn't contain a scalar predicate. All that is available in *compared to John* is an individual and individuals cannot be compared to degrees.

- (4) a. Bill is tall compared to John
- b. $\# \exists d$ [Bill is d -tall & $d > \mathbf{John}$]

So instead, Beck, et al., propose that comparison phrases are *context setters*, which the pragmatics uses to infer the size standard.

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- (5) a. Compared to John, Bill is tall.
 b. $\Box d$ [Bill is d -tall & $d > c$]
 c = the size standard made salient by the utterance context
 c := John's height

There are a few initial reasons why we should question this conclusion. First, there are plenty of phrases that appear to be quite free in terms of where they are pronounced. For instance, prepositional phrases as in (6).

- (6) a. In the bed, John slept fine.
 b. John, in the bed, slept fine.
 c. John slept in the bed fine.
 d. John slept fine in the bed.

And, *for a NP* constructions and phrasal comparatives in English cause the same problem for the degree semantics:

- (7) a. Adam is big [for an ant].
 b. Adam is bigger [than John].

There is not a property (or sortal) of the ants or of John to abstract degrees over in (7a,b). Does this mean that the examples in (6) and (7) should be handled in the pragmatics as well? Kennedy (2003) has offered a compositional analysis for constructions like (7a), and Heim (1985) has proposed a compositional analysis of phrasal comparatives, so it is at least possible to force a compositional analysis.

Furthermore, comparison phrases are in complementary distribution with *for a NP* constructions and measure phrases.

- (8) a. Adam is big for an ant.
 b. *Adam is big for an ant compared to Woody.
- (9) a. Harry is five feet tall.
 b. *Harry is five feet tall compared to a boy his age.

If *for a NP* and measure phrases are compositional, then one would hope that semantic items that are in complementary distribution with them be accounted for under a compositional analysis as well.

The structure of this paper is as follows. I will first argue that comparison phrases are not sentence level adjuncts. Rather, they achieve their adjunct positions via movement from within the scalar adjective phrase. Furthermore, they behave like syntactic arguments of the adjective with respect to certain diagnostics. Given these conclusions, it is reasonable to require a compositional semantics to account for them. Then, I will present a preliminary account of the compositional semantics of comparison phrases that treats them as denoting intervals (or sets of degrees) on a scale which the adjective takes as its internal argument and relates to its external argument. This analysis will include a solution to the lack-of-a-sortal problem pointed out by Beck, et al.

2. Comparison phrases are not sentence level adjuncts

While there can be an unbounded dependency between the comparison phrase and the adjectival clause, as (10) shows us, the comparison phrase cannot be base generated anywhere. Separating the adjectival clause and the comparison phrase by an island results in unacceptability.

- (10) **Compared to John**, Frank said Mary believes that **Bill is tall**.

- (11) a. ***Compared to John**, Mary believes the claim that **Bill is tall**.
 b. Mary believes the claim that **Bill is tall compared to John**.
- (12) a. ***Compared to John**, Mary saw the man **who is tall**.
 b. Mary saw the man **who is tall compared to John**.
- (13) a. ?**Compared to John**, Mary wonders whether **Bill is tall**.
 b. Mary wonders whether **Bill is tall compared to John**.
- (14) a. ***Compared to John**, that **Bill is tall** annoyed Mary.
 b. That **Bill is tall compared to John** annoyed Mary.
- (15) a. ***Compared to John**, a picture of **Bill being tall** frightened Mary.
 b. A picture of **Bill being tall compared to John** frightened Mary.
- (16) a. ***Compared to John**, Mary got fired because **Bill is tall**.
 b. Mary got fired because **Bill is tall compared to John**.

We can conclude this data that the comparison phrase must start out inside of or next to the adjectival clause. If comparison phrases are pragmatic 'context setters' which can be base-generated anywhere, then there should be no such syntactic dependency.

3. Comparison phrases start out inside the adjective phrase

Constituency tests indicate that the comparison phrase and scalar AP form a constituent. For instance, the entire AP can be fronted along with the comparison phrase.

- (17) John is tall compared to Bill, and **tall compared to Bill** he should be considering Bill is so short.

Also, we can elide the AP and the comparison phrase.

- (18) John is tall compared to Bill, and Tom is, too.

In (18), Tom is interpreted as being *tall compared to Bill*, not just being tall. So, we can conclude that the AP and the comparison phrase are a constituent. The point can be made stronger: if *compared to Bill* were simply a context setter, then we would expect the possibility that the deletion site be resolved only with *tall*. This would mean that the comparison class used to interpret *Tom is tall* could be set by the context as something other than *Bill*. But (18) has no such meaning; we can only conclude that Tom is tall compared to Bill.

Movement diagnostics reveal that the comparison phrase must start out inside the adjective phrase. First, a pronoun in the comparison phrase can be bound by a quantifier in the subject position as in (19).

- (19) Compared to his₁ mother, every boy₁ is tall.

If pronouns must be c-commanded by quantifiers that bind them, then the comparison phrase must have started out below the subject in (19).

Second, we know that when a phrase moves, it becomes an island to extraction (Wexler and Culicover 1981). We can extract out of comparison phrases, but only when the comparison phrase is to the right of the adjective.

- (20) a. *Who₂ is₁ compared to t₂ John t₁ tall?
 b. *Who₂ is₁ John t₁ compared to t₂ tall?
 c. *Who₂ is₁ John compared to t₂ t₁ tall?

- d. Who₂ is₁ John t₁ tall compared to t₂?

Therefore, we can conclude that the comparison phrase is base-generated to the right of the adjective.

This could still be a high, adjoined position (say, adjoined to VP). To test for this, we only need to put an adverb between the verb and the comparison phrase.

- (21) a. Who₂ is₁ John t₁ depressed compared to t₂ recently?
 b. *Who₂ is₁ John t₁ depressed recently compared to t₂?

When the adverb is to the right of the comparison phrase, extraction is still possible. But when the adverb position clearly indicates that the comparison phrase has been extraposed, extraction becomes unacceptable. We can conclude from this that the comparison phrase must be base-generated immediately to the right of the adjective. This conclusion combined with the constituency tests and binding facts indicate that the comparison phrase starts out inside the AP. This could mean that the comparison phrase is adjoined to the AP (forming another AP), or it is an argument of the AP.

4. Comparison phrases are arguments of the adjective

Three diagnostics provide evidence that comparison phrases are arguments of the AP, not adjuncts (despite their mobility and optionality). First, the relative acceptability of the wh-island violation in (13) indicates that the comparison phrase is an argument, since adjunct violations exhibit much harsher violations (Lasnik and Saito 1984).

- (13) a. ?Compared to John, Mary wonders whether Bill is tall.
 b. Mary wonders whether Bill is tall compared to John.

- (22) *When compared to John₁, Mary wonders whether Bill is tall t₁?

Second, it's well known that extraction out of adjuncts of NPs and APs is disallowed (23), but extraction out of arguments of NPs and APs is licit (24).

- (23) a. *How many chapters₁ did John read [a book with t₁]?
 b. *Which library₁ did John read [a book in t₁]?
 c. *What₁ is John [proud within t₁]? (*proud within limits*)
 d. *What₁ is John [happy with t₁]? (*happy with some trepidation*)

- (24) a. Who₁ did John read [a book by t₁]?
 b. Which subject₁ did John read [a book about t₁]?
 c. Who₁ is John [proud of t₁]?
 d. Which student's work₁ is John [happy with t₁]?

It was already shown that extraction out of comparison phrases is acceptable.

- (25) Who₁ is John tall compared to t₁?

This indicates that the comparison phrase is an argument of the adjective since it patterns like (24).

Third, adjuncts can obviate Principle C violations by moving as in (26), but arguments cannot as in (27). (Lebeaux 1992)

- (26) When John₁ goes out tonight, he₁ will be happy.

- (27) *Which book about Noam₁ does he₁ think Mary read.

Comparison phrases do not obviate Principle C when they are fronted.

- (28) a. *Compared to John₁'s mother, he₁ is tall.
 b. *Compared to every boy's₁ mother, he₁ is tall.

Again, this indicates that the comparison phrase must be an argument of the adjective since obligatory reconstruction is a property of arguments, not adjuncts.

So far, we have seen evidence that comparison phrases behave like arguments of the scalar adjective. If this conclusion is correct, then we would hope that a theory of compositional semantics can account for them.

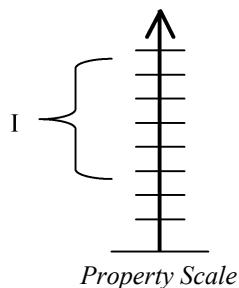
5. Semantics of comparison phrases

The purpose of this last section is to propose a compositional semantics for sentences that contain comparison phrases. The proposal will primarily deal with solving the Beck, Oda and Sugisaki problem concerning the lack of a sortal in the comparison phrase. In order to do that, I will first review a proposal by Schwarzschild and Wilkinson (2002) for the semantics of comparatives. Then I will show how comparison phrases can be treated compositionally.

5.1 Interval semantics for comparatives

I will assume that gradable adjectives are relations between individuals and degrees (Cresswell 1976; von Stechow 1984; Kennedy 1998; Schwarzschild and Wilkinson 2002; and many others). But I will use Schwarzschild and Wilkinson's (2002) system where degrees can be collected together into sets of degrees that are called "intervals".¹ A little background is needed to understand their theory.

Degrees are densely ordered points on abstract representations of measurement called scales. We can visualize scales as infinitely long measuring sticks that start at zero and go upward. Intervals are collections of degrees. In the representation below, some degrees are marked with horizontal lines. An interval *I* is indicated with a bracket that marks a set of degrees. (There are, of course, many other degrees and intervals than just those indicated.)



Gradable adjectives relate individuals to intervals on the relevant scale.

- (29) $\|tall\|(x,I) = 1$ iff x 's height is in I

(29) simply says that *tall* relates an individual x to a set of degrees I by requiring that x 's measurement of height be *inside* the set of degrees I . All that is left to do is supply the adjective with an internal argument. If that internal argument is supplied by the context, then *John is tall* means that the individual *John*'s height is inside I where I is the contextually salient interval for deciding that someone is tall.

We also need to define a difference operation as follows:

¹ This is actually a slightly simplified formulation of the Schwarzschild and Wilkinson (2002) interval system from Schwarzschild (2004).

(30) $[d' - d]$ is an interval on a scale that starts at degree d' and ends at degree d

This is an asymmetric relation: for $[d' - d]$ to return a value, d' must be below d . In Schwarzschild and Wilkinson (2002) this does some of the work of the greater than '>' relation (which is also asymmetric) found in most analyses of comparatives.

Also, they define a differential SOME as follows:

(31) $\text{SOME}(I) = 1$ iff I is non-empty.

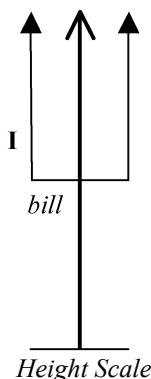
So, $\text{SOME}[d' - d] = 1$ iff d' is below d .

A simple comparative in Schwarzschild and Wilkinson is given the truth conditions in (32).

(32) a. John is taller than Bill is [~~tall~~
 b. $\exists I [\text{tall}(\text{john}, I) \ \& \ I = \{d: \text{tall}(\text{bill}, \{d': \text{SOME}([d' - d])\})\}]$

(32b) says: there is an interval I on the height scale and I is the interval that contains all of the degrees that are above Bill's height and I contains John's height. Under the Schwarzschild and Wilkinson analysis, [-er than Bill is] is an interval that is taken as the internal argument of the adjective *tall*. The diagram below indicates I as the interval that starts immediately above Bill's height and extends upwards.

(33)



Tall simply says that the height of its external argument *John* must be in I .

I'll assume that *John is tall compared to Bill* has the same truth conditions as *John is taller than Bill is*. Then we need *compared to Bill* to be an interval, namely the interval that extends from just above Bill's height upwards.

(34) $\| \text{John is tall compared to Bill} \| = 1$ iff $\exists I [\text{tall}(\text{john}, I) \ \& \ I = \| \text{compared-to-bill} \|]$

where $I = \| \text{compared-to-bill} \|$ iff $I = \{d: \text{tall}(\text{bill}, \{d': \text{SOME}([d' - d])\})\}$

Again, the Beck, et al. problem is apparent with (34): there is no *tall* in *compared to Bill*.

5.2 A covert sortal

In order to deal with the lack-of-a-sortal problem, I will propose that there actually is an abstract sortal in the comparison phrase. This sortal is required by the lexical properties of the verb *compare*, which often takes an overt sortal as an argument when it is used as a tensed verb in a simple declarative sentence.

(36) John was compared to Bill with respect to height.

When the property of comparison is not stated overtly, I will assume that there is existential closure over the position.

- (37) $\| \text{John was compared to Bill} \| = 1$ iff
there is a scalable property S such that John was compared to Bill with respect to S

With this assumption in place, we can say that a comparison phrase denotes an interval on some scale S .

- (38) $I = \| \text{compared-to-Bill} \|$ iff $I = \{d: \exists S [S(\text{bill}, \{d': \text{SOME}([d' - d])\})]\}$

Specifically, the comparison phrase in (38) denotes the interval above Bill on some scale. Integrating (38) into the argument position of *tall* gives us:

- (39) $\| \text{John is tall compared to Bill} \| = 1$ iff
 $\exists I [\text{tall}(\text{john}, I) \ \& \ I = \{d: \exists S [S(\text{bill}, \{d': \text{SOME}([d' - d])\})]\}]$

(39) should be read: *there is an interval I and I is above Bill's measurement on some scale and John's height is in I.*

In the end, S must a property that relates individuals to the tall-scale because:

- (40) $\text{tall}(\text{john}, I) = 1$ *implies that* I is on the tall-scale
 I is on the tall-scale *implies that* all degrees d which make up I are on the tall-scale
 d is on the tall-scale and $\text{SOME}[d' - d] = 1$ *implies that* all degrees d' are on the tall-scale
 d' is on the tall-scale and $S(\text{bill}, \{d': \dots\}) = 1$ *implies that* S relates *bill* to degrees on the tall-scale

Therefore, S is *tall*.

6. Conclusion

I have shown that comparison phrases behave syntactically like the types of objects a compositional semantics should account for. They start out inside of the adjective phrase, moving to other surface structure positions through the course of the derivation. They also display properties indicating they are syntactic arguments of the scalar adjective. I provided a preliminary compositional semantics of comparison phrases that treats them analogously to comparative constructions and solves the lack-of-a-sortal problem. Under this analysis, comparison phrases denote intervals on non-specific scales. The matrix adjective takes these intervals as arguments, which in turn requires that the non-specific scale actually be the same scale that the adjective uses. I will point out a few problems with this analysis next and conclude with a few remarks about Beck, et al. (2004).

Each problem with the semantic analysis from section 5 that I want to point out here stems from the assumption that comparison phrase constructions are just like comparatives. First, the implication that S be on the tall-scale is not necessarily conclusive. Kennedy (1998) argues that multiple adjectives can share the same scale. This is how he explains subcomparatives such as in (41a) and the anomalous (41b).

- (41) a. The door is taller than the desk is wide.
b. ??My copy of *The Brothers Karamazov* is heavier than my copy of *The Idiot* is old.

Kennedy claims that (41a) is possible because *tall* and *wide* work off the same basic scale and therefore the two degrees can be compared. But, *heavy* and *old* do not share a scale, and so the two degrees cannot be compared. If the sharing of basic scales is the right way to think about scalar

adjectives like *tall* and *wide*, then under the analysis of comparison phrases presented above, we would expect a subcomparative analogue.

(42) *Bill is tall compared to John with respect to width.

In fact, the analysis predicts that *Bill is tall compared to John* could simply mean that Bill's height measurement is greater than John's width measurement, and clearly it does not.

Second, while I think that *Bill is tall compared to John* and *Bill is taller than John* have the same truth conditions, more complex examples diverge.

(43) a. John is tall compared to the students at Simon Fraser.

b. John is taller than the students at Simon Fraser.

In (43a), John need only be tall compared to *most of the students at Simon Fraser*. But in (43b), he must be taller than all of the students. The semantics that was proposed in section 5 cannot account for this distinction.

Third, when embedded under a world operator, clausal comparatives display the old Russell (1905) ambiguity. (44a) could have the meaning in (44b) in which John is mistaken about the length of the yacht, and it could have the meaning in (44c) in which John actually believes a contradiction.

(44) a. John thinks the yacht is longer than it is.

b. $\Box d' \Box d$ [think(john, the yacht is d'-long) & the yacht is d-long & $d' \geq d$]

c. think(john, ($\Box d' \Box d$ [the yacht is d'-long & the yacht is d-long & $d' \geq d$]))

This ambiguity has typically been explained in terms of the comparative quantifier taking scope outside the modal operator (the mistaken thought reading) or inside the modal operator (the contradictory-thought reading). (See von Stechow 1984, Heim 1985, Larson 1988, Kennedy 1998 and many others for alternative explanations and discussion.)

Comparison phrases do not show the same ambiguity, even though we can hear the comparison phrase take scope outside the modal verb.² Only the contradictory-thought reading is available corresponding to low scope of the degree quantifier. in (44c).

(45) a. John thinks that the yacht is long compared to itself.

b. Compared to the yacht, John thinks that it is long.

Regardless of how the ambiguity is accounted for in (44a), what is important is that since I have basically treated the comparison phrase just like a clausal comparative, we would expect to get both readings. If we take the ambiguity in (44a) as a diagnostic for quantification (of some sort) over degrees, then we should conclude that comparison phrases do not involve quantification over degrees (and possibly do not involve degrees at all).

Each of these problems seems to indicate that comparison phrase constructions are not on a par with clausal comparatives. Perhaps, we can also conclude that the way in which they are different concerns the inclusion or exclusion of degrees, quantification over degrees, or degree abstraction. The semantic analysis provided above can be viewed as an exercise to see in what way one could force a degree analysis of comparison phrases, and the result was admittedly rather construction specific. Heim's (1985) analysis of phrasal comparatives and Kennedy's (2003) analysis of *for a NP* constructions are also construction specific and rather stipulative. In both, the semantic composition copies the necessary sortal into the comparison class phrase. All of this might indicate that these constructions don't deserve degree-based analyses.

In this respect, I agree with Beck, et al. (2004). The spirit of their conclusion is that comparison phrases (and, I would add phrasal comparatives and *for a NP* constructions) are not the same kinds of

² Maribel Romero pointed this out in the QA period.

things as clausal comparatives. But it is only in this respect that I agree with them. After all, they do give a degree analysis of comparison phrases, it is just that the degree is supplied in the pragmatics rather than the semantic component. If the syntactic arguments above are conclusive enough to warrant providing a compositional semantics for comparison phrases, then it looks like the degree semantics is not the way to do this.

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